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ABSTRACT

This paper looks at efforts by the Armed Forces to identify where the need for literacy instruction exists and how to provide it when the need is identified. It begins by discussing the literacy context of a military career to provide a perspective on how literacy is or may be used in the services. The demands for literacy are shown to be much higher than for comparable civilian careers. Discussion then focuses on the development of literacy programs in the military, focusing on the evolving concept of literacy. Finally, the paper examines the current literacy policy, the major literacy programs under development, and the innovative uses of technology in literacy instruction. Computers receive a special emphasis. A five-page list of references is provided. (YLB)

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CDC Technical Report No. 22

Literacy Instruction in the Armed Forces

Thomas M. Duffy

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LITERACY INSTRUCTION IN THE ARMED FORCES[1]

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Armed Forces personnel must operate and maintain some of the most sophisticated, costly, and dangerous equipment in existence. Because of both complexity of this equipment and the massive numbers of personnel who must be trained each year, literacy is perhaps more critical in the Armed Forces than in any other segment of our society.

This paper looks at these efforts by the services to identify where the need exists and how to provide literacy instruction when the need is identified. We will begin by discussing the literacy context of a military career, not so much to quantify or precisely define "literacy" but rather to provide a perspective on how literacy is or may be used in the services. We will find the demands much higher than for comparable civilian careers. We will then look at the development of literacy programs in the military, focusing on the evolving concept of literacy. Finally we will examine the current literacy policy, the major literacy programs under development and the innovative uses of technology in literacy instruction.

THE MILITARY CONTEXT

Approximately 350,000 individuals enter the Armed Forces each year. This group is selected from a much larger group of applicants through an extensive aptitude and ability testing program which includes paragraph comprehension and vocabulary subtests. Thus this testing provides a mechanism for selecting applicants with "adequate" literacy skills. However, given the number of personnel required to maintain military readiness in comparison to the size of the pool of potential enlistees, such an explicit

selection strategy simply is not feasible. While "literacy" selection is implied in testing, the only explicit application has been to insure that applicants have basic decoding skills. Thus while the distribution is truncated at the low end, the literacy levels of the enlistees roughly represent the abilities found among high school graduates. The median reading grade level (RGL) of entering recruits is 9.5 as compared to a national average of 9.6 (Sticht, 1982). Approximately 40% read below the ninth grade level and 6% below a seventh grade level.

While the literacy skills are typical, the demand for literacy is anything but typical. The recruit enters a new society in which an unfamiliar set of rules govern virtually every aspect of life. In approximately eight weeks the recruit must learn about the legal restrictions; the authority hierarchy, and appropriate responses to individuals at various positions in it; health, safety, and security requirements; the social services available and how to access them; and the basic requirements for maintaining personal self and quarters. There are manuals which provide all of the relevant documentation and these manuals also serve as the text for the classroom instruction in recruit training. Sachar and Duffy (1975) found that while literacy skill was unrelated to nonacademic performance in recruit training it did predict success in the academic phase. Thus from the very beginning of a military career there are significant literacy demands.

After recruit training the enlistee enters technical skill training. Since most new enlistees enter the service directly out of high school they possess few technical skills. Yet within a very short time they will be expected to operate and maintain state of the art equipment. There are well over 9,000 technical training courses offered by the services to provide the necessary

training, ranging from a day to six months. For some technical jobs the individual may spend over a year in training before ever going to the job.

While there is considerable hands on experience and lecturing in this training, text is central to all of the training programs. Sander and Duffy (1982) found an average assignment of up to 30 pages of text in group paced courses and up to an average assignment of 94 pages in the self paced courses. In a study by Sticht et al (1977), students reported they averaged 2 hours each day performing various reading tasks. Consistent with the Sander and Duffy (1982) findings, those students in the self paced instruction (which was also the more technical instruction) reported spending more time reading.

The services also use correspondence to deliver instruction. Successful completion of specific correspondence courses is a prerequisite for being considered for advancement. In correspondence instruction, of course, the entire content is presented via text. Sticht, et.al. (1977) found that personnel reported spending up to 100 hours in reading for a single correspondence course.

The amount of technical documentation which must be used on the job is extraordinary. For example, a single stack of all of the documentation required to support the equipment on the Navy's nuclear aircraft carrier the U.S.S. Carl Vinson would be higher than the Washington Monument. Over one million pages of documentation are required to support the operation and maintenance of the B1 bomber.

Of course the simple presence of such massive amounts of documentation does not mean that the documentation is necessary or even used. It would be inappropriate to presume a literacy requirement simply

based on the presence of text. The important issue is whether or not that text must be used. Kern (in press) in a study of the information seeking behavior of vehicle repairman performing their jobs found that use of technical manuals decreased with job experience. Thus, one might presume that documentation is only necessary for the novice. However, he also found that experienced mechanics were just as likely to make errors as mechanics who had never performed the task before. He concluded that while experience with the task extinguishes the use of manuals (as well as people) as information sources, it does not eliminate need for information.

In another study, Sticht (1975) gave vehicle repairman specific job tasks to perform and provided the relevant technical text. The higher the literacy skill of the personnel the more likely they were to use the documentation. At all literacy levels, the performance of those personnel who used the documentation was better than those who did not use it. Thus there is empirical evidence of the importance of the technical documentation. At a less empirical level, there are reports of multi-million dollar losses in equipment due to the failure to either read or comprehend the technical instructions (Toomepuu, 1979). And finally, at a common sense level, it is hard to imagine operating or repairing ships, airplanes, or tanks without using the technical documents.

Use of the manuals may in fact require quite sophisticated literacy skills. The General Accounting Office (1979) reports one case where the technician had to refer to 165 pages in eight documents and look at 41 different places in those documents just to isolate and repair one fault in a radar system. Because of the complexity of the equipment and the costs associated with not utilizing documentation, there is a formal requirement in each service that

personnel must use the technical documentation during all maintenance work. Failure to have the appropriate manual turned to the appropriate page can, and has, led to disciplinary action. Thus the literacy skill demanded by the tasks and the manuals must be used on a daily basis.

Sticht et al (1977) used a survey approach to compare the amount and kind of reading of civilian and military workers. As can be seen in Table 1, reading technical manuals is only one of a large number of reading tasks the military personnel performed. Further the the military personnel reported spending almost twice as much time reading than did the civilian workers.

Insert Table 1 about here

In sum, we find a very significant literacy context beginning with recruit training and continuing through the military career. There is a substantial amount of text which is used and the level of use is directly related to performance and success. Further, the literacy requirements are substantially greater the requirements in comparable civilian jobs.

LITERACY PROGRAMS IN THE PAST

An examination of the current military literacy programs reflects a very inconsistent and perhaps confused view of just what is meant by "literacy". For example, literacy courses are offered to meet both general educational and training objectives. One might expect that the curriculum in the training courses would most clearly reflect the job reading requirements. After all, when literacy "training" is required as part of the job it is a clear statement of the functional requirements of the job. However, the literacy training courses are as likely to have a general adult or high school reading content as the literacy courses in the educational command (GAO, 1977:1983, Sticht,

1982). In fact. both general reading and job reading content may be found in both education and training courses. Much of the inconsistency can best be understood through a consideration of the history of literacy instruction in the military.

Literacy Programs: The Early Days

In the late 18th and early 19th century there are reports of literacy instruction being offered to Washington's troops at Valley Forge (Weinert. 1979) and of chaplains being formally charged with the responsibility for the literacy instruction of the enlisted men (Fletcher, 1977). Thus the Armed Forces offered literacy instruction since the very inception of the services. However there was little need for the use of text in performing military jobs in those early days. The instruction seems to have been offered not necessarily to benefit the service but rather to provide basic schooling to English youth who chose to enter the service as apprentices instead of attending school (Fletcher, 1977). Literacy instruction thus began as a general education objective.

Literacy Programs: 1900 to 1975

In the early twentieth century. continued growth in both military forces and the complexity of equipment resulted in a gradual shift from the traditional master-apprentice training model to classroom based. group instruction. Manuals had to be written to support the group instruction and the role of literacy skill now encompased the need to comprehend unfamiliar information presented in a text to carry out a job. This is the first expression in the military of the now familiar and dominant functional objective of literacy.

The functional requirements for reading comprehension skills were driven home to the nation when the Army, in 1918. introduced the first massive paper and pencil intelligence testing program in the United States. According

to Resnick and Resnick (1977) the results of this testing provided the first indication of a literacy "problem" in the United States: 30% of the 1.7 million men taking the Army Beta test could not understand the form because they could not read well enough.

Acceptance of the functional objective of literacy led to the recognition of comprehension as an important component, but while the concept of literacy expanded to include both decoding and comprehension skill there was little richness in the understanding of the skills. Reading comprehension was still a unitary concept – a set of skills one applied in a regular manner to any text material. There was no distinction between reading tasks in terms of the goal of reading or the knowledge skills required.

LITERACY POLICY

Instructional courses in the military were, and still are, offered through two different offices or commands: education and training. The training command is responsible for all of the courses specifically designated to prepare the individual for his or her job duties. This, of course, constitutes the bulk of the instruction. Since a training course is part of the military requirement, it is considered part of "the job." It is taken during normal duty hours, and the content is very strictly specified.

Courses under the educational command are aimed at self improvement which is usually reflected in the achievement of some civilian certification, e.g., high school completion or GED. Instruction in these courses is not considered essential to the job; however, until recently it has been common to give personnel "release time" from job duties to take them. Educational courses are generally offered by local civilian schools as a part of their normal curriculum either on a contract basis or through tuition reimbursement.

While the objective of literacy instruction had been educational, the functional view led to a programmatic distinction between literacy courses for educational purposes and literacy courses for training purposes. Thus literacy instruction was, and still is, offered under both the education and training commands. Literacy training was offered as a job training program and hence as part of the normal work requirements. However, the "training" amounted to a recruit level course in each service and required the achievement of reading scores ranging from the 5th to the 6th grade level (McGoff and Harding, 1974; Sticht and Zapf, 1976; GAO.1977). Thus the objective of literacy training was very limited in scope, being available only at the recruit level and only for achieving minimal literacy.

Literacy instruction in the education program is much broader. Courses are offered at the level of adult basic education, high school completion and GED. Additionally, personnel may take the courses at any point in their career.

INSTRUCTIONAL DESIGN

While a policy distinction had been made between education and training, the unidimensional concept of literacy meant that there could be little functional difference in the programs. Indeed, both education and training programs followed a general literacy model consistent with the view which was, and still is, prevalent in the nation's schools (Chall, 1967). This model can be seen in the measurement of literacy requirements and literacy achievement in the programs, in the instructional content and focus of the literacy curriculum, and in the instructional objectives.

Measuring Reading Requirements

Literacy training aims at preparing personnel for their job reading tasks.

Thus analysis and specification of reading requirements were needed to guide instruction. Since reading was considered a general skill, the primary focus was on a general measure which could be applied widely to index the difficulty of texts. It was unnecessary to know the purpose for reading or the nature of the reading tasks, e.g., locate information, follow procedures, summarize large segments of text, read tables and graphs. Rather what was needed was an index of the difficulty level of the material which could be compared to the skill level of the reader: an index of the amount of comprehension skill required to use the text.

Since the view of reading was tied to the general model held in the schools, a school grade level index became popular. This scale was intuitively understood when used to describe any text -- most people feel they know what is meant by a 5th or 8th or 12th grade reading level. Further the scale could be directly related to the reading skill of the individual since tests of that skill used the same grade level metric. Initially assessing the grade level of text was simply a matter of judgement. The criterion for literacy training was a graded level which was based on someone's intuitive estimate of the difficulty of the material (Duffy, 1977; McGoff and Harding, 1974; Fletcher, 1977). In the 1940's however Rudolph Flesch (1948) developed a "readability formula" as a tool for more objectively assessing texts.

A readability formula is an algebraic equation predicting the difficulty one will have in comprehending a passage based on its physical characteristics. Numerous formulas have been developed since Flesch's initial work, and most yield a reading grade level score based on the measurement of the length of the sentences and the length or difficulty of the words in the passage (Klare, 1963; 1976). Each service developed its own formula and applied it to large

samples of job and training texts to specify reading requirements objectively. These text measures are the basis of the prediction of the level of reading skill that will be required to comprehend the text.

What is meant by "reading skill" and "comprehension" when these formulas are used? If we look at the development of the formulas we will find that "reading skill" almost always means the score on a standard reading comprehension test (the reader answers questions about paragraphs) and "comprehension" of the passage for which the prediction is being made almost always means the ability to get 70% or 75% correct on a set of multiple choice questions about the passage (or a cloze score equivalent to that). Thus in every way the readability formula reflects that unitary concept of literacy, i.e., the ability to read a paragraph and answer questions. Regardless of the reader's subject matter knowledge (for example, experienced and novice electronics technicians reading an electronics text), and regardless of the typical reading task (for example, looking up a particular fact, following a procedure, or studying for a later test) a score is derived using the same formula to indicate the amount of reading skill required to use that text. (See Duffy, 1985, for a more extensive discussion of the interpretaion of readability formulas.)

The Instructional Objective

The objective of the literacy instruction differs as a function of whether the course is offered under education or training. In education, the only summary objective was to obtain a certificate or diploma. The in-course requirements for demonstration of skill or ability were determined by the civilian educator offering the course. The job reading -- or readability -- requirements were only relevant in the sense of providing a broad justification

for the need for high school skill. i.e.. for the contract or tuition reimbursement program.

The training courses. on the other hand, have the very specific objective of preparing personnel for future military reading requirements. Thus we would expect the entry and exit criteria to be closely related to the job requirements. However. all of the services used standardized. civilian reading tests to assess entry and exiting literacy skills (Sticht and Zapf. 1976: McGoff and Harding, 1974). The most frequently used tests, at least since the early 1960's, are the Gates MacGinite. the Stanford diagnostic, the Nelson Denny, and the New York Metropolitan or USAFI.

The primary objective of testing was to assess comprehension skill. In each test with the partial exception of the Metropolitan test, individuals were asked questions about prose passages. This was "reading;" the better the individual performed the better "reader" he was judged. To ensure the purity of the measure of reading skill, the paragraphs topics and the information presented were designed to be unfamiliar to the reader. Thus prior knowledge would not enter into, and contaminate, the measure of reading. These criteria, like the readability scores, reflect the unidimensional "decode and comprehend" view of literacy skill – the content of the material and the information seeking task did not make any difference.

Given the unidimensional view, we might expect that the grade level score required to exit the training program would at least match the readability scores identified for the job material. However, the officially stated objective and criterion for each of these recruit level literacy training programs was achieving a 5th or 6th grade score on the designated reading test (McGoff and Harding, 1974: Sticht. 1982: Goldberg, 1951). The specification

could not have been the based on readability analyses since the readability of the recruit level material was at the 9th to 11th grade level (Sticht and Zapf, 1976), well beyond the limited training objective. Thus we see that military reading requirements are virtually ignored in the instructional objectives of these reading programs.

No official training courses were offered for personnel reading above a 6th grade level despite the fact that the average manual in the service was found to be written at the 10th to 14th grade level. Indeed there were no literacy training programs available for personnel after the recruit level course. In part this may have been a matter of economy and in part it may have reflected the view held by many in the military that literacy instruction has no place in the military (see Sticht, 1982 for a discussion of the policy issues relating to literacy instruction).

This void in higher level literacy training courses was filled by the educational programs. If a supervisor felt one of his or her personnel required instruction, that individual could be encouraged to take the high school completion or GED related literacy course. Since enrollment in education courses was voluntary, an incentive of release from job duties was offered. Thus the only mechanism for delivering "post recruit" literacy training was courses with a general education objective delivered by instructors who are likely unfamiliar with job reading requirements.

The Instructional Content

The content of the recruit level literacy training programs, with few exceptions, followed the general literacy viewpoint. The instruction focused on decoding skills, vocabulary development, and "comprehension skills". Instruction in reading comprehension involved strategies for, and drill and

practice in, reading a paragraph and answering main idea, purpose, and fact questions. Then, as now, elementary and secondary school based reading materials were used extensively. Table 2, taken from McGoff and Harding (1974), is a listing of the variety of materials being used to teach basic literacy to recruits in the military services in the early 1970's. While there is some military content, the objective of that content is motivational. That is, while the topic was military oriented, e.g., "Men In The Armed Forces", the instructional approach was still oriented toward paragraph comprehension.

Insert Table 2 about here

This approach to literacy training contrasts sharply with all other training programs in the military. Training content is specified very precisely by the services. The specification is based on a detailed analysis of the job requirements. Because of the cost of training and the amount of training required it is essential that everything needed to perform the job is taught but that there is no instruction on irrelevant or unnecessary topics or skills. Indeed, because of the importance of training, the military has always been a leading sponsor of research on task analysis and instructional procedures (O'Neil, 1979). Each of the services came to require that specific instructional system design procedures be followed in developing all training courses (TRADOC, 1975). Among other things, these requirements included insuring that instructional objectives be derived directly from an analysis of task requirements and personnel skills, that the objectives make explicit the materials to be used and the exact task to be performed to demonstrate acquisition of a skill, and that all instructional materials be directly related to the objectives.

There are no other training courses in which the skill or knowledge instructed is so clearly divorced from the job requirements as they are in reading. One might suggest that literacy is somehow a skill which is so basic that it requires an educational or generic instructional approach and thus task analyses is unnecessary. If that is the case then we might expect generic skill instruction in each of the three "R's". However, mathematics is one of the three R's, yet few separate mathematics training courses are geared to a fifth grade level. In electronics training, for example, mathematics instruction is based on an analyses of the requirements for successful job performance. Further, the instruction is placed in a relevant context. The formula E=IR (in which the letters E, I, and R refer to specific concepts in electricity) is taught, and students learn how to manipulate that formula, e.g., R=E/I. They are not taught general mathematics nor are the formulas presented in abstract terms, e.g., A=BC, giving the student the extra burden of generalizing the learning to the particular application.

Literacy Programs: 1970 - present

The view of literacy as a generic set of skills began to change in the 1970's. With both the application of the ISP model to reading and a growing understanding, or at least a recognition, of the complexity of the reading processes. The actual reading tasks personnel had to perform became the focus in designing and defining the curricula and the standards (Sticht, 1982).

During this time the view of reading as an active "meaning generation" process began to emerge. Reading is not simply the linear translation of a string of words; not all words, phrases, or sentences are equally important. Rather, the reader must identify the relevant information in the text and generate an understanding of that information. Productive reading then

"requires strategies that facilitate the selection of the most useful cues" to the meaning of the text (Spiro. Bruce and Brewer. 1980). We identify those cues to meaning through our understanding of text structures and through our understanding of the the subject matter. (Sticht. 1974; Glaser, 1983; Wittrock. 1982)

INSTRUCTIONAL DESIGN

Three important considerations in the design of reading instruction derive from the cognitive analyses of reading. First, the text cues salient to "understanding" the text will depend in part on the particular text structure (Kieras. in press; Sticht. 1975). Thus, in instruction. we must address the cues and strategies for "using" tables of contents, indexes, procedural text. comparative prose, technical text, tables. graphs, etc.

Second, effective reading strategies differ as a function of the purpose of reading. Sticht (1975) for example distinguishes two basic reading purposes: reading-to-do and reading-to-learn. In the former task, commonly found on the job, the reader is searching for a particular fact or small segment of information for immediate use in accomplishing some task. Surely the reading strategies here are not the same as for reading-to-learn tasks where the individual is typically reading larger segments of information which he must organize and store in long term memory for later use.

Third, the reader's comprehension of the text will depend on his or her knowledge of the subject matter: the more relevant knowledge a reader has the more information he or she can comprehend. Reading involves applying knowledge structure to aid in interpreting or decoding the text and then incorporating that new information into the knowledge structure to further aid interpretation. Literacy instruction. then. must take into account those

knowledge requirements. At a very minimum, the instruction should utilize subject matter relevant to the readers future reading requirements. In the process of "learning to read" he or she will be "learning about" the particular topic, building knowledge structures (Wittrock, 1982; Osborne and Wittrock, 1983; Glaser, 1983).

Notice that both the ISD view of instructional development and the cognitive process view of reading lead to very similar recommendations and these recommendations contrast sharply with the "general comprehension" view. Indexing reading requirements is not simply a matter of applying a readability formula. The categories of reading tasks, the text structures on which those tasks are performed, and the content domain of the text must be identified. The result is a catalogue which samples the reading tasks. Of course, the classifications in the catalogue as to structures and types of tasks must reflect some concept of differences in the knowledge and cognitive requirements (see the discussion of the Air Force program in the final section). But it is none the less a sampling rather than an indexing.

The objective of literacy instruction is to improve the ability of the student to use similar kinds of materials as defined in the cataloguing process just described. The requirement for literacy instruction can only be determined by assessing the student ability to carry out particular literacy tasks using samples of material.

Finally, the instructional material must derive from the analysis of the particular reading tasks and subject matter requirements. Commercial reading programs which address general literacy are inappropriate. The literacy curriculum must be tailored to the particular text structures, reading tasks, and subject matter the individual will encounter in the future. A very important

question which still must be answered is just how tailored must the reading instruction be. What task components must be incorporated into it?

AN EXEMPLARY PROGRAM

The seminal work in the military reflecting the ISD and cognitive frame of reference is that of Sticht and his colleagues (Sticht. 1975) in developing the Functional Literacy Training (FLIT) curriculum for the Army. FLIT was a six week literacy course for lower literate Army personnel who had just completed recruit training. Curriculum materials were based on the results of interviews with personnel at the follow-on duty stations, in which they were asked to identify the reading tasks performed in the last 48 hours.

The two phases in the FLIT instruction represented the two basic reading objectives reported by encumbent personnel. The reading-to-do phase included separate modules on using tables of content, indexes, tables and graphs, forms, procedural information, and expository text, the kinds of text structure that the interview data indicated personnel had to use at the next duty station. The particular materials used in each module were derived from the job reading materials so the particular subject matter domain was also relevant. Job reading task tests, based on the same interview data, were used as pre and post tests in each module. The student was only required to work on a particular module if he or she could not demonstrate mastery on the pretest.

The reading-to-learn phase focused on strategies for building knowledge structures in the particular content domains the student will encounter at the next duty station. The instruction was based on the theory that oral, written, and graphic languages represent the same knowledge base (Sticht et al. 1974). Thus the important issues were building the appropriate knowledge

base and transforming particular representations of the knowledge into alternative and perhaps more usable representations. Strategies were taught for transforming a particular representation into pictures, matrices, flow charts, or prose representations as a means of aiding understanding.

The National Guard (Fox, McGuire, Joyner, and Funk, 1976) and the Air Force (Huff, Sticht, Joyner, Groff, and Burkett, 1977) have developed literacy programs directly modeling the FLIT approach. It has also served as the conceptual forerunner of a Navy pretechnical training program (Baker and Huff, 1981) and other military literacy training programs (see Sticht, 1982).

LITERACY POLICY

Until now, little systematic planning had been given to literacy issues. Literacy was provided through the educational program as a benefit or, in times of severe personnel requirements, as a basic skill training requirement (Sticht, 1982; Ginzberg and Grey, 1953). Policy development began in 1970 with the recommendations of a tri service Working Group on Listening and Reading in the Armed Forces. Included in the recommendations was that:

> "...literacy training be designed following a systems approach which would include the thorough assessment of the literacy requirements of the various military occupations, the orderly structuring of the training programs geared to satisfying the occupational requirements, and, most importantly, well designed evaluative procedures to provide feedback for program development." (Sticht, 1982, p.24)

The basic objectives expressed by the working group were reaffirmed by the Deputy Assistant Secretary of Defense in 1974 (McGoff and Harding, 1974). However, the general reading model was still the prevalent model of the reading process and thus the focus was on assessing and meeting grade level requirements. In 1977 the General Accounting Office (GAO, 1977) reviewed the literacy training programs (still restricted to recruit training or

immediately after recruit training) in each of the services and found they all used a general literacy approach to instruction in which neither the instruction nor the instructional criterion were related to job requirements. The one exception was the limited implementation of the FLIT program in the Army. The GAO also reported questionable effectiveness of the programs in improving job literacy skills.

The GAO (1977) recommended to Congress that the criteria and content of the literacy training programs in the services should be made job relevant. In 1978 the Joint House Senate Appropriations Committee added teeth to the recommendation. As a condition for receiving appropriations the Committee required that all instructional programs offered during regular duty hours be job relevant (GAO, 1983). This requirement had an immediate and major impact on both the educational and training literacy programs.

The literacy training programs were clearly offered during duty hours and just as clearly they were not job related (McGoff and Harding, 1974; GAO, 1977). Thus significant program changes were required. The Navy let a contract to develop a job related curriculum for the lower literate recruits. The curriculum is now in use at all three Navy Recruit Training Centers. (In this case the requirement served not only to change the curriculum but to standardize it.) There are two basic components to the curriculum: "Literacy" and "Study Skills". The formen still tends to rely on commercially available material and focuses on phonics and comprehension. The latter, however, is based directly on the recruit level learning requirements and materials.

The Army initiated a Basic Skills Education Program (BSEP) in response to the Congressional requirement. There were two phases BSEP I and II with the BSEP I focused on the recruit-level, lower literate program. The stated

objective of that program is "to provide basic literacy instruction in reading and arithmetic to form a basis for Military Occupational Specialty Training". Sticht (1982) describes the program as using job related reading material. However, a recent GAO (1983) report found that the BSEP was decentralized with each Army base contracting with local school districts for its "own" BSEP program, which was almost always general literacy. The GAO recommended that those programs be terminated until a job relevant curriculum could be developed.

The education programs offered during duty hours were in fact the primary target of the Congressional requirement. In response, the Navy and the Army initiated "new" education programs described as providing educational (Army) or functional (Navy) skills necessary to improve job performance. The Navy program name changed to "Functional Skills Training" and the Army program became "Basic Skill Education Program II". Because the programs were job related in name and objective, they continued to be offered during normal duty hours. However, both services continued to contract with schools for the basic skills instruction and since those contracts only provided for the delivery of instruction, curriculum content continued to consist of already developed material.

SUMMARY

During this period a literacy policy developed consistent with both the basic principles of instructional design and the cognitive understanding of literacy. The policy calls for a shift from the basic educational orientation of the previous period. Unfortunately curriculum efforts lagged significantly behind policy. While there was wnat might be considered a prototype curriculum (FLIT) developed which embodied the policy, all in all the names of the programs changed but there was little change in content.

In part this reflects resistance to the concept of functional literacy. Many program directors suggested that the functional approach, limited to actual job reading requirements, will result in a very restricted skill -- the personnel will be able to read the job manual but not the newspaper. Such a reaction is extreme, but does represent a real concern for generality.

The failure to provide funding to support the policy implementation presented another basis for the lag in curriculum change. A functional approach requires instruction individualized to the particular job/training context. Thus separate courses based on a task analyses of job reading requirements are required for each job area. Yet the contracts for the Navy's Functional Skills Training and the Army's BSEP are for instruction only and the contract is awarded to the low bidder. Hence there is no allowance or incentive to develop targeted programs or even modify existing programs.

CURRENT LITERACY CURRICULA

The literacy needs of military personnel today are served by a wide range of literacy courses presented through both the the education and the training commands in each service. In total over 59 million instructional hours (the number of individuals enrolled times the number of hours in the course) were spent in basic skills during 1980 at a cost in excess of $70 million. This is based on an enrollment of over 210,000 personnel in reading oriented basic skills programs (Sticht, 1982). The duration of those programs ranged from 14 to 360 hours, the longest being the Army BSEP II, in which the majority of personnel were enrolled (Sticht, 1982).

LITERACY POLICY

There is now a generally accepted policy that literacy instruction is essential to military training and must be targeted to the specific reading

requirements personnel face on the job. Thus literacy is being recognized as a basic job skill. However, the grade level concept has not entirely left us. Rather, a two tier notion is evolving: a 5th to 6th grade level requirement for recruit training and a ninth grade level for all post recruit personnel (Gott, 1983; Sticht, 1982). Presumably, as job derived curricula become common place this artificial grade level requirement will begin to be replaced with task derived criteria.

The focus on job literacy requirements has also led to a more general consideration of the basic requirements and skills presumed in training and on the job. The progression from an analysis of reading requirements to an analysis of literacy requirements is progressing one step further to an analysis of basic skills requirements or prerequisite skill and knowledge requirements. Thus literacy instruction is being integrated into broader prerequisite skills instruction.

More importantly, funds are now being allocated to support the literacy policy. Each of the services is providing major funds for the development of literacy instruction targeted to the specific literacy needs of the personnel.

Along with the funding for curriculum development has come increased centralization of the programs. Until this time local commands determined the content of both the education and training literacy curricula through either local curriculum development efforts or through the contracts for instruction (Duffy, 1977). However, when the Navy responded to the 1978 congressional requirement for functional literacy (GAO, 1983), a curriculum was developed an imposed upon each of the recruit Centers. Similarly, the new JSEP curriculum is being centrally developed for use at all Army bases.

Of course even with centralized development of the curriculum, the day

to day management and delivery of the instruction is still at the local level and those "local levels" are dispersed throughout the world. The army has recently initiated a program to aid all of the local instructors and managers of literacy programs. It is called the Military Educator's Resource Network and provides three sources of assistance to the educators:

1. The "NETWORK fact sheet" is published monthly. This flyer translates research findings into generally useful information for instructors and managers. For example, a recent issue focused on "Computer Literacy and the Army Educator" discussing how computers are used, describing how to implement a computer-based course, and providing references for further reading.

2. A rapid response assistance service. Instructors and managers of military basic skills program can telephone at any time for immediate assistance, information, or advice regarding their program.

3. A resource service. Personnel can write to the Resource Center inquiring about specific approaches or specific literacy programs. The Resource Center will review the program indicating the evaluation data, alternatives, and means of obtaining it.

CURRENT AND PLANNED LITERACY PROGRAMS

Both the requirement for centralization of the management of the literacy instruction and the provision of funds to achieve the functional literacy policy objective has led to major programmatic literacy curriculum development efforts throughout the military. Multi course programs widely applied in the respective services reflect each of the services basic concept of and policy towards literacy.

The Navy's "Job Oriented Basic Skills Program" (JOBS)

The JOBS program is the first major attempt to extend the functional literacy concepts of the FLIT program (Sticht,1975) to basic skills training in preparstion for highly technical areas. The objective is to provide courses of instruction "... that would enable lower aptitude personnel to increase their mastery of selected basic skills and knowledges enough to permit them to

enter and complete ..." apprentice level technical training. Here, however, "lower aptitude" was defined in terms of the entry requirements for the particular technical training (Harding, Mogford, Melching, and Showel, 1981). Thus an individual might be "lower aptitude" (.i.e., not qualified) for electronics training but normal or even higher aptitude for another technical area.

Separate JOBS courses have or are being developed for each of the major content areas of technical training. Initially four JOBS courses were developed: propulsion engineering, electronics, administrative/clerical, and Operations. The courses varied in length from four to eight weeks (120 to 240 instructional hours). After JOBS training the students enter an apprentice training course in that content area. While the content is specific to the particular training area, all JOBS courses include instruction in mathematics, study strategies, terminology, comprehension of apprentice training course materials, and reading tables and graphs.

An evaluation of the effectiveness of JOBS produced mixed results. In part the results are unclear because the only comparison group contained personnel who were fully qualified for the technical training. In terms of technical training performance, 79% of the JOBS students graduated while 89% of the qualified students graduated (Baker and Hamovitch, 1983). Without the proper control group it is unclear whether we should be delighted at how well the JOBS students did or disappointed that they had twice the attrition of the fully qualified students. Since the students were not initially qualified for the technical training and in fact were well below qualification requirements one can suppose that few if any would have succeeded without JOBS preparation.

Job performance ratings at the first job assignment were only slightly below the ratings for the fully qualified. More importantly the discharge rate (loss from the service) was LESS than half of the discharge rate for the fully qualified. The reason for this is unclear but perhaps it reflects the fact that the JOBS students are at the maximum of their capabilities while the fully qualified students are still taking advantage of opportunities for improvement.

The Army's "Job Skills Education Program" (JSEP)

JSEP is the current title of the Army's comprehensive basic skills curriculum development effort. There are two phases: JSEP I will be offered at the recruit level with the objective of preparing the individual for entry level requirements; JSEP II will be offered at all Army Education Centers and will prepare the individual for the basic skill requirements in the first tour of duty (Anderson, 1982).

The foundation of the JSEP program is an analysis of the basic skills requirements at entry and in the first tour of duty (Defense Supply Service, 1982) including an extended task analysis (Reigeluth, 1983) of the basic skills requirements in 94 major areas of specialization within the Army (Anderson, 1982). It had been hoped that the analysis would include not only those requirements that are parts of the particular job, but all of the basic skills required of a member of the armed forces in society. However, the analyses have been limited primarily to job-specific basic skills.

A sample of some of the basic skills requirements examined in the initial task analysis is shown in Table 4. The results of the task analysis will provide the basis for developing "locator tests" to be used in identifying personnel requiring JSEP instruction. There will be 420 hours of JSEP curriculum developed (Defense Supply Service, 1982). Since the instruction is to be

targeted to specific technical and career requirements it is presumed that there will be multiple JSEP strands. Thus it is unclear how much curriculum will be developed for any particular career area.

Insert Table 3 about here

At least fifty percent of the JSEP curriculum is to be computer based (Defense Supply Service, 1982). The focus is on microcomputers because, among other factors, the micro readily allows for instructional delivery and assessment at remote sites.

The Air Force "Job Oriented Basic Skills Assessment and Enhancement System"

The Air Force views their work as involving the development of three interrelated subsystems. A job measurement subsystem (JMS) will define basic skills and develop a methodology for assessing and categorizing basic skill requirements. The JMS serves as the basis for the development of a personnel measurement subsystem (PMS) to measure personnel skill levels. Finally the PMS and the JMS will form the basis for the development of a training specification subsystem (TSS) which will be the blueprint for designing and delivering the basic skills instruction as well as a system for organizing and managing the instructional program.

The three subsystems all all preliminary to the actual development of instruction. Indeed, the Air Force program may be characterized by the amount of attention given to systematic analysis. This is especially clear in the plans for the development of the JMS, the foundation of this and any instructional program (Gott, 1983).

The Air Force is questioning the very definition of basic skills. The

Army and Navy programs used an atheoretical behavioral definition of basic skills. For example. in terms of literacy there would simply be a description of the literacy task performed. At some point however those tasks must be grouped and classified to form a basis for instructional development and personnel assessment. How do we sample the tasks to instruct or assess? The atheoretical approach does not provide any guidance and hence the basis for classification is either based on arbitrary surface level similarity features or on an implicit and likely an ill defined theory of what the underlying basic skills are.

The Air Force is attempting to avoid the classification and identification problems by placing "basic skills" in a cognitive theoretical context. Within this framework the focus is on the information processing demands of the job and on the information processing capabilities of the airman. The airman is viewed as an information processing system with limited cognitive capacity. The objective of the Air Force effort then, is to identify the fundamental cognitive operations (basic skills) required in each job. These will form the basis for the PMS and the TSS.

The development of a procedure or system for defining and identifying the cognitive skills is the first, and the crucial, step in the Air Force program. Since cognitive behavior seems to be based on both the particular topic knowledge and processing skills (Glaser. 1983; Sticht. 1975; Wittrock. 1983) it would seem that the classification system will have to have a dimension or dimensions reflecting the knowledge domain and a dimension or dimensions reflecting the cognitive skills and capacity requirements. This research could make a major contribution to basic skills research and practice by providing a rational basis for interpreting what has long been a very confused concept.

BASIC SKILLS AND TECHNOLOGY

In addition to the large programmatic efforts there has been a very significant movement toward the use of computer technology in the delivery of instruction. What follows is a brief description of some of the more notable research efforts to utilize computer and video disc systems in basic skills instruction. All of this work is in the research stage and reflects the latest and in my judgement the more interesting uses of technology.

The Army's STARS Program

The Army has numerous bases in Europe that are very small and remote. While there are personnel assigned to these bases who require basic skills instruction, the numbers do not warrant contracting or hiring an instructor. To meet the needs of these small remote sites, the Army has developed a microcomputer and videodisc based program to teach reading, mathematics, writing, and problem solving (Johnson, 1984). The program (or more properly, the series of programs) is designed to be a stand alone instructional package.

The STARS system presents the instruction in the context of the student as a space team member with numerous tasks to perform, including demonstrating that a time machine really works. The video disc system presents the motivational context of the space ship and coworkers. The student must read instruction handed to him, read warnings on the wall, follow directions, do calculations to determine supply requirements, etc. His response provides both an assessment of skill level and input for branching to appropriate instruction.

If the student fails one of the assessment tasks he leaves the videodisc system, under directions of the space ship commander, and receives an

appropriate basic skills instructional module on the micro computer. Thus actual instruction is independent of the videodisc system or the "space ship" scenario.

The STARS system has the positive feature that it does stand alone and hence can be used when no instructor is available. It also provides a strong motivational context. The video is excellent and very enticing. The actual basic instruction however is standard drill and practice and does not seem to be driven by any particular conceptual model.

The Army's Study Strategies program

This project is more properly known as "Spatial Data Management System" (Seidel, et.al., 1983). This is another videodisc program but the focus is on developing effective study strategies and test taking strategies. In contrast to STARS both the motivating context and the instruction is through interactive videodisc.

The context is an Army training base with various learning requirements. The enlisted personnel on the video tape represent the various stereotypes of learners. They discuss various test taking and study strategies, evaluating each others approaches. Then the students engage in various learning activities providing a visual model of the effective as well as the ineffective strategies (this is not a "demonstration in the traditional sense but rather they occur as part of the story line). Finally, there are additional learning situations but now the basic skills student is called upon to choose the proper strategy for the particular situation. The student makes the choice for the character and the video program branches to provide appropriate feedback.

A particularly nice feature of this program is that the student receives two presentation strategies: direct instruction on the skills and a demonstration of effective use.

The Army's Hand Held Tutor

The Army found that after initial technical training lower literate personnel understood the meaning of only 50% of the critical terminology for the occupational area. Thus the objective of this project was to develop a system for providing review of occupationally specific vocabulary after technical training (Budgeman and Wisher, in press). Since the personnel are on job assignments, the instructional system had to extend to nontraditional instruction where personnel could study on the job, in the barracks, at mess hall, or whenever they had time. The result was a compact microcomputer-based tutorial system. The computer can operate off of a battery pack and the entire system fits into a normal briefcase. Thus it is highly portable.

Vocabulary modules of up to 145 words can be installed on the computer. Thus an unlimited number of occupationally specific review packages can be developed. Words are organized into groups of five or six and the student completes instructional exercises on each group. In the first exercise the student is given an off-line multiple choice test on the words. The answers are entered into the computer for record keeping purposes. After the test the words are "explained": the word and definition are presented on the computer during which time the student can press a "say" key to hear the word spoken. The student is also referred to an accompanying "text" to see a picture of the item referred to.

The second exercise, "picture battle," presents the student with a picture of a piece of equipment, e.g., a radar console, in which the parts are numbered. He then hears a part name spoken by the computer and must enter the number of the part. The third exercise is "word war". The computer displays a definition and speaks three words or it speaks one word

and displays three definitions. The student must make the proper match between word and definition. When an error is made the student receives the correct response and is referred to the appropriate illustration.

The Navy's Computer Based Functional Literacy Project

The Navy developed a micro computer-based reading program which uses the principles of generative instruction (Wi er, 1982): the program generates instruction on any data base of words nd paragraphs. To create a data base for vocabulary instruction one need only enter a dictionary of the word, definition and an example sentence. The data base for comprehension instruction requires only entering paragraphs which are five sentences long. Given that input the program generates instructional exercises which take approximately an hour to complete per set of ten words and two paragraphs. Thus instruction can be tailored quite easily to the specific reading needs of the individual.

The instruction is organized into modules of ten words and two paragraphs where the paragraphs use the particular vocabulary items thus linking vocabulary and reading instruction. The student first studies the 10 vocabulary words: he or she copies the word, recalls the word, studies the definition and then reconstructs the definition from memory. The comprehension exercises involve reading the paragraph, completing a cloze test on each sentence, reconstructing the proper sequence of sentences to recreate the paragraph, and generating each sentence through a series of multiple choice tests of "what comes next". The comprehension exercises are based on a cognitive model of reading in which the reader is in a psycholinguistic guessing game (Goodman, 1968) using prior knowledge as well a sentence semantics and grammar to anticipate what is to come.

In addition to the exercises there are review tests in which the student matches words to definitions. The words may be from the particular module or from any previous module. Finally, the student receives performance feedback in the form of a game where the objective is to score the maximum number of points (make the fewest errors) in each module.

The program has been used in reading instruction for recruits where the materials were taken from the recruit training manuals (Wisher, 1982). It has also been used with enlisted personnel onboard the USS Tripoli using materials from a required correspondence course on leadership and in preparing Navy personnel for training as operation specialists (Duffy and Hartz,1984). In the latter application the vocabulary was identified by asking students in the course to report the words that were difficult to understand in the particular chapter they were studying. Paragraphs using those words were then taken from the manual and modified for use in the instruction. Evaluation compared the program to a general literacy program in terms of improvement in functional and general literacy skills.

The Navy's Reading Skills Program

The Navy is evaluating a series of three programs which focus on the development of three cognitive skills which research has indicated are key skills distinguishing good and poor readers. The programs are based on a componential analysis and theory of reading (Fredrickson, 1981). Basically, reading is viewed as a cognitive activity in which a host of cognitive skills must operate in a coordinated fashion. Reading would be a slow and laborious process if all of those skills had to be under direct intentional control. Hence a major distinction between successful and unsuccessful readers is the degree to which the lower level perceptual and decoding skills

have been automated. Fredrickson's research focused on identifying the cognitive skills which most clearly distinguish successful and unsuccessful readers in terms of automaticity.

Fredrickson (1981) identified three primary skills: integration of letter units, decoding efficiency, and use of the context of the sentence to anticipate appropriate sentence completions. He then developed programs to develop automaticity in these skills. That is, the tasks are easy enough when there is time for direct evaluative attention to the information , e.g., judge whether a particular three letter sequence is in a six letter word or judge whether a word properly completes the sentence, "The architect looked pleased as he reviewed the ...". However, the gradations in task difficulty are based on the speed with which the judgements must be made. The words to be judged are presented at faster and faster rates across hundreds of trials, eventually leading to a presentation rate where direct evaluative attention is not possible and therefore automaticity is achieved.

The three programs are presented in game formats, e.g., horse racing and ski jumping, where the payoff is based on both accuracy and speed in such a way that accuracy is a requirement and speed is the goal. The programs are to be evaluated with recruits reading between the fourth and sixth grade level.

CONCLUSION

Far too often technology is embraced simply for its own sake. We see this today with the micro-computer revolution. Most people buying a micro have little idea what they will do with the computer once they get it. Software developers are similarly developing programs, it would appear, simply to have "instruction" on the computer -- and it most often simply involves the

use of the computer as a page turner. The focus is on developing computer-based instruction rather than effective instruction. Fortunately the Armed Forces programs do not seem to fit that mold. All of the programs have undergone significant developmental effort and there is strong rationale for the use of computers in literacy instruction. Most of the reasons are in direct support of the literacy policy discussed earlier.

Perhaps the primary reason is that microcomputers can provide instruction when required, regardless of the size of the student group. The cost effectiveness of teacher-based instruction, however, is a function of class size and contracts typically require a minimum class size of fifteen. This benefit of computer based instruction is most evident on ships at sea and at remote locations where there are few people stationed; it is just this context that STARS was designed to address. However, given the emphasis on functional literacy instruction, class size can become a major problem even at a large Armed Forces base. Since functional literacy requires that instruction be tailored to the particular reading requirements the individual will face. Specific literacy programs are needed to address specific literacy requirements.

A second rationale for computer-based literacy instruction is that it insures a particular course of instruction is delivered to the student. It allows for centralized control of instruction, consistent with the larger program developments described in the previous section and with the recommendations of the General Accounting Office (1983). It will be recalled that while Congress and the General Accounting Office (1977) specified that literacy instruction must be job related if it is offered during duty hours, the instructional programs initiated through contract with local schools were mostly

general literacy programs. Computerization then, insures that the functional requirements will be addressed.

The third reason is that computers provide a context within which the student can imagine applying the skill. This is true of the STARS program as well as the learning strategies program. The importance of contextualizing can be viewed from several perspectives. A sizeable history of research on "imitation" learning (Bandura and Walters, 1970) points to the efficiency in learning when a model is provided for the learner to imitate. Of course, contextualizing also relates to the whole concept of the use of simulators in learning. Providing a simulated learning situation in which to practice learning skills, as in the Army's learning strategies program (Seidel, et.al., 1983), is conceptually similar, for example, to providing an aircraft simulator to practice flying skills. Finally, context is important from a cognitive science perspective in that it provides a framework for organizing and storing information and it provides retrieval cues to aid recall of the skill in similar contexts (Bransford, 1979).

Fourth, the computer systems can provide an expertise in the technical content area. Without computers, a functional literacy class would require a teacher who has competency or familiarity in the technical content area as well as in literacy instruction. The computer, as for example the Army's hand-held tutor, can provide the necessary technical expertise.

Fifth, computer systems can provide instructional exercises the teacher would have great difficulty providing. In some cases the effect is simply to remove the task of having to make up an unending number of student exercise sheets. In other cases it permits the use of particular instructional approaches. For example, Fredrickson's (1981) notions of automaticity could

not be trained without the timing precision available through computer systems. The Army's study skills program (Seidel, et.al., 1983) allows the student to "get lost" if he or she fails to follow directions properly. The Navy's computer-based functional literacy program (Wisher, 1983) promotes the use of linguistic context in reading through a series of sentence generation exercises.

Finally, the computer-based systems provide for immediate feedback on reading performance. Of course, self pacing and immediate feedback are primary benefits of computer-based instruction in general. However, these features are of particular importance in reading instruction. Basic tenets of instruction are that the student should be guided in his or her engagement with the instructional materials and should receive immediate feedback on his or her performance with that material. In content areas this is readily accomplished. We can teach geography or any other content area by discussing the concepts with the class -- learning and immediate feedback can occur through an oral interchange.

Reading, however, is a silent business not readily open to observation. In a classroom situation, which focuses on reading, the student is given large numbers of exercise sheets (reading exercises) to complete. But there cannot be immediate feedback and corrective instruction on the exercise because the student must wait for the teacher to circulate through the room. Thus, if the instructor wants to provide immediate feedback on reading, instruction must be oral, i.e., discussing definitions and reading aloud. However, while this results in immediate feedback, the task does not represent the intended reading behavior -- silent reading. Computer based systems can quite clearly engage the student in reading behaviors and provide immediate feedback on the effectiveness of those behaviors.

One might consider the motivational effects as a seventh benefit of computer-based instruction. New technology has a strong but transitory motivational effect on most people. Computer-based instruction, however, offers the opportunity to create very motivating contexts Almost all military computer-based literacy programs provide either a gaming component or an enticing scenario of activities. I have seen students work four hours a day for ten days at the Navy computer-based functional literacy programs without complaining. In fact, on the first day many students will pass up the ten minute break each hour to continue on the program. The reasons they give for their interest include the relevance of the materials to their career, the "gaming" component of the program, and the simple conviction that "computers are better." However, while computers provide specific opportunities for motivating students, the motivational component is not unique to the computer. There are motivational strategies an effective teacher can use that cannot be computerized. Indeed, a "good" teacher could probably outdo the computer in providing motivation.

THE FUTURE

The evolution of literacy instruction in the Armed Forces has seen an increasing movement toward functional literacy. Further, an understanding of the cognitive requirements of the literacy tasks and the application of instructional systems design (ISD) methodology in developing the instruction are seen as the primary factors in achieving a functional curriculum. For the future we must ask what is required to more fully develop and apply the cognitive and ISD principles to literacy instruction.

The programs described above are currently under development and thus they are the programs of the immediate future. In them we see two primary

strategies for effectively applying cognitive and ISD principles to literacy: centralized development and computer-based delivery. In addition there are four other management considerations for extending the application of ISD and information processing concepts.

INTEGRATION OF LITERACY INSTRUCTION

We have begun to recognize that literacy is a basic job and training skill requirement.

While the identification of literacy skills now follows basic ISD tenets, the delivery of literacy instruction is still isolated from the rest of the training program. Literacy is still considered a prerequisite skill which must be taught prior to, and for some reason separately from, the rest of the training content. However, this really reflects a general literacy concept in which literacy is something given to a person which permits one to progress with the rest of training.

There are several problems with such reasoning. First, there are always numerous prerequisite or entry level skills for a training program, yet only literacy is taught in isolation. Second, basic considerations of instructional design would suggest that teaching a required skill in isolation from other skills is far less effective than an integrated approach (Reigeluth, 1984). Finally, a job analysis would likely indicate that different literacy skills are required at different points in training or on the job. Hence, that analysis would dictate an integrated approach.

A natural progression in the application of ISD concepts to literacy instruction would involve the treatment of literacy as any other skill or knowledge. Rather than a literacy course and a job training course there would be a single job training course with a literacy component distributed

through the training as required. (See Sticht et.al., 1977b for further discussion of an integrated training program.)

A DEVELOPMENTAL VIEW

Thus far I have avoided discussing the effectiveness of the particular literacy programs -- and for good reason. While the instructional philosophy underlying the military programs has evolved significantly there is one critical aspect which has remained unchanged. Literacy instruction is seen as a "quick fix", a remediation which one can receive and then be better. Thus all of the literacy instruction programs range from three to six weeks in duration. Further, while a individual may enter several programs during the course of his or her career, there is no linking of programs, no tracking of individuals through the system.

Evaluation of the short duration literacy programs have indicated that the practical gains in reading skills are about the same regardless of the instructional approach -- the programs are too short to reveal practical differences in effectiveness. A comparison of the military programs for the fourth to six grade reader indicated that the gain in reading skill was about 2.0 grade levels with a loss of about 1.0 grade levels shortly after instruction is completed (Duffy, 1975). This held true for a program based on a careful analysis of instructional objectives (100+ objectives), for a program based on an analysis of functional literacy requirements, for a program based on a commercial general literacy package, and for semester long school courses. The one thing that all of these programs had in common was their duration.

Basically, the message is that learning to read for adults is not like learning to ride a bicycle. Rather, just as for children a developmental approach is required (Sticht, in press). The evaluation of the short duration

programs indicates that gains can be made. Furthermore, the functional literacy program indicated that when functional literacy is the objective the gains are greater in functional literacy skills (Sticht, 1975). However, the gains are not sufficient in and of themselves. A one grade level gain or a .5 grade level advantage of a particular approach is simply not of much practical significance.

What is required in further development of literacy programs is a recognition that literacy instruction does not provide a quick fix. Multiple programs are required which are in tune with the career development patterns (Sticht, et.al., 1977b). Further personnel must be tracked through the programs so we can begin to understand the development of literacy skills.

A CONCEPTUALLY BASED CLASSIFICATION SYSTEM FOR LITERACY SKILLS

The cognitive analysis of literacy skills must be extended to provide a basis for defining and classifying literacy requirements. The proposed Air Force "Job Oriented Basic Skills Assessment and Enhancement System" (Gott, 1983) will try to provide just such a definition. The need and rationale for such an approach to understanding literacy was discussed previously in conjunction with the Air Force program. It is emphasized again here because of its importance. The alternative is the task and behavioral analyses of basic skills (see, for example, Sticht, et.al. 1975a). However, such a listing of literacy tasks does not provide a rational basis for understanding or predicting the generalization of instruction to new literacy tasks. It will only be through a conceptual understanding of literacy tasks that such prediction can be made.

STAFF DEVELOPMENT

The final area requiring future research and development activity is in the training of instructors and management personnel in the underlying

rationale for the literacy programs. Regardless of the quality and effectiveness of the instructional materials, the instructional program will not be successful unless management and instructors understand and buy into the approach to literacy instruction. This is especially important when the approach to literacy instruction is new and unfamiliar, as is the functional approach we have been discussing.

What is being proposed, of course, is a staff development effort. While staff development is generally viewed as a key ingredient in the success of any new instructional program, there has been virtually no such effort in conjunction with the military programs. The staff (both instructional staff and base commanders) must understand the basic cognitive and instructional principles underlying the program and how the components of the course relate to those principles. The building of a team with all members contributing is essential for maintaining a successful program.

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Footnotes

1. For further information on the NETWORK write: Military Educators Resource NETWORK. 1555 Wilson Blvd., Suite 508, Rossylin. VA. 22209.

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Table 1

Percent of the General Civilian Work Force and the Navy Work Population who reported reading particular types of mateial. (from Sticht et al 1977)

Reading Materials	Civilian Work Population (%)	Navy Work Population (%)
Signs/Schedules/Notices	43-57	94-99
Forms/Logs/Invoices/ Accounting Statements	39-44	72-91
Letters/Memos/Notes	48	47-78
Manuals– Written Instruction/ Directions	43	88-93
Legal Documents (Navy Regulations)	14	68
Reports/Articles in Publications (Correspondence Courses)	34	51

Table 2

Instructional Materials Used in the
Armed Forces Literacy Program
(from McGoff and Harding 1974)

Commercial Materials	Instructional Grade Level
Checkered Flag Series	4-5
Dolch Basic Sight Word List	1-3
Dr. Spello	1-5
EDL 100 Audit Literacy Program	1-5
EDL Study Skills Library	4-9
How and Why Wonder Books	4-5
In Orbit	4-5
McCall-Crabbs Standard Test Lessons in Reading	2-12
Merrill Linguistic Reader	2-4
Milton Bradley Reading Aids	3
Reading Motivated Series	6-9
SRA Better Reading Books	5-10
SRA Reading for Understanding Laboratory	3-12
SRA Reading Laboratory	4-6
SRA Pilot Laboratory	3-6
Springboards Reading Laboratory	1-6
Top Flight	4-5
Military Materials	
On Your Mark	1-3
Get Set	3-5

Table 2 (cont.)

Commercial Materials	Instructional Grade Level	Military Materials	Instructional Grade Level
Modern Reading Skills	4-6	Go	6+
Mott Basic Language Program	1-5	Men in the Armed Forces	4-6
Mott Comprehension Series	1-5	My Country	4-6
Mystery Series	4-5	New Flights in Reading	4-6
On Target	4-5	Servicemen Learn to Read	3-5
Pacemaker Classics	4-5	Stories fo Today	3-5
Programmed Reading (Globe)	5-6	Stories Worth Knowing	3-5
Programmed Reading (Sullivan)	1-3	Basic Military Requirements	6+
Reader's Digest Skill Builders	2-8	Blue Jacket's Manual	6+
Reading Attainment System	1-5	Recruit Training Command Study Guide	6+

Table 3

Example of literacy requirements identified in the JESP analysis. (from Anderson, 1982)

CONTENT READING

- Follow highly-detailed step direction in order to accomplish a sequence of task activities.
- Determine the essential message of the paragraph or section of written material.
- Infer from a written source, which does not explicitly provide required information, in order to make a decision.
- Synthesize information from written sources which contribute to the completion of a task activity.

INFORMATION ACCESS

- Locate a technical manual, field manual, or any related source document by code number and title.
- Use the table of contents, index system or sub-system heading, appendix and glossary to locate information.
- Determine, after scanning or skim-reading, whether the information is relevant.
- Cross-reference within and across source documents to select information needed to perform a routine.
- Organize information from multiple sources into a sequenced series of events.

Table 3 (cont.)

ILLUSTRATIONS

- Interpret a three-dimensional projection or exploded view of object(s) for assembly, disassembly, or position in system or sub-system.
- Follow illustrations, or photographs, arranged in a sequential order, as a guide
- Integrate information from various sources to select a course of action.

FLOW CHARTS

- Use a simple linear path of an organizational chart to list events in a sequential order.
- Use a linear path of a flow chart to provide visual and textual directions to a procedure, to arrive at decision points, and to provide alternate paths in problem solving.
- Translate the significance of the symbols into physical activities.